Greenville County Technical Specification for:

EC-05 HYDRAULIC EROSION CONTROL PRODUCTS (HECP)

1.0 Hydraulic Erosion Control Products

1.1 Description

Use Hydraulic Erosion Control Product (HECPs) as an allowable mulch for temporary cover by mulch, temporary cover by seeding or permanent cover by seeding applications. Do not use HECPs as a channel liner or for areas receiving concentrated flow.

1.1.1 HECP Type 1

Install HECP Type 1 in the following situations:

- When the required observed functional longevity of soil protection is 60 days.
- When the soil is dry and rain is not expected within 48 hours after application.
- When there is a high degree of certainty that heavy rains will not immediately follow application.

Do not use HECP Type 1 as Temporary Erosion Control Blankets, channel liners, or in areas receiving concentrated flow. Do not use HECP Type 1 as a HECP Type 2, Type 3, or Type 4.

1.1.2 HECP Type 2

Install HECP Type 2 in the following situations:

- When the required observed functional longevity of soil protection is 90 days.
- When the soil is dry and rain is not expected within 48 hours after application.
- When there is a high degree of certainty that heavy rains will not immediately follow application.

Do not use a HECP Type 2 as Temporary Erosion Control Blankets, channel liners, or in areas receiving concentrated flow. Do not use HECP Type 2 as a HECP Type 3 or HECP Type 4.

1.1.3 HECP Type 3

Install HECP TYPE 3 in the following situations:

- When the required observed functional longevity of soil protection is 180 days.
- When the soil is dry and rain is not expected within 24 hours after application.
- When there is a high degree of certainty that heavy rains will not immediately follow application.

Do not use a HECP Type 3 as Temporary Erosion Control Blankets, channel liners or in areas receiving concentrated flow. Do not use HECP Type 3 as a HECP Type 4.

1.1.4 HECP Type 4

Install HECP Type 4 in the following situations:

- When the required observed functional longevity of soil protection is 365 days.
- As a Temporary Erosion Control Blanket for slope applications only. Refer to the current *Rolled Erosion Control Products (RECP) Specification.*
- In environmentally sensitive wetlands and other wildlife areas not compatible for products containing netting.
- When the site requires immediate erosion protection and there is a risk of impending weather.

Do not use HECP Type 4 as channel liners, or in areas receiving concentrated flow.

1.2 Materials

1.2.1 HECP Type 1

Provide a HECP Type 1 composed of non-toxic fibers consisting of a minimum of 70% wood fiber or 70% natural fibers that contain non-toxic tackifiers that upon drying become insoluble and non-dispersible to eliminate direct raindrop impact on soil.

Provide a HECP Type 1 that has no germination or growth inhibiting factors and does not form a water-resistant crust that can inhibit plant growth. Provide a HECP Type 1 that completely photo-degrades or biodegrades. Add seed, lime, and fertilizer to the HECP Type 1 mixture as outlined in the Seeding Specifications.

Furnish HECP Type 1 where all components are pre-packaged by the manufacturer to assure material performance and compliance with the minimum requirements of Table 1. Under no circumstances will field mixing of HECP Type 1 additives or HECP Type1 components be accepted.

Provide HECP Type 1 listed on the most recent edition of the *SCDOT Qualified Product List 79.*

1.2.2 HECP Type 2

Provide a HECP Type 2 consisting of a hydraulically applied matrix composed of a minimum of 70% of non-toxic defibrated organic fibers with, at a minimum, one of the following non-toxic additives that upon drying become insoluble and non-dispersible to eliminate direct raindrop impact on soil:

- Soil tackifiers,
- Soil flocculants,
- Soil polymers,
- Cross-linked hydro-colloidal polymers, or
- Cross-linked tackifiers.

Do not use materials composed of paper, cellulose fiber, or any mixture containing paper or cellulose.

Provide a HECP Type 2 that has no germination or growth inhibiting factors and does not form a water-resistant crust that can inhibit plant growth. Provide a HECP Type 2 that completely photo-degrades or biodegrades. Do not use materials listed for use as a HECP Type 1. Add seed, lime, and fertilizer to the HECP Type 2 mixture as outlined in the Seeding Specifications.

Furnish HECP Type 2 where all components are pre-packaged by the manufacturer to assure material performance and compliance with the minimum requirements of Table 1. Under no circumstances will field mixing of HECP Type 2 additives or HECP Type 2 components be accepted.

Provide HECP Type 2 listed on the most recent edition of the *SCDOT Qualified Product List 79.*

1.2.3 HECP Type 3

Provide a HECP Type 3 consisting of a hydraulically applied matrix composed of a minimum of 70% of non-toxic defibrated organic fibers with, at a minimum, one of the following non-toxic additives that upon drying become insoluble and non-dispersible to eliminate direct raindrop impact on soil:

- Soil tackifiers,
- Soil flocculants,
- Soil polymers,

- Cross-linked hydro-colloidal polymers, or
- Cross-linked tackifiers.

Do not use materials composed of paper, cellulose fiber, or any mixture containing paper or cellulose. Provide a HECP Type 3 composed of:

- A minimum of 70% non-toxic long strand organic fibers.
- Non-toxic thermally processed or refined long strand organic fibers heated to a minimum temperature of 212 degrees Fahrenheit for sterilization purposes.

Provide a HECP Type 3 that has no germination or growth inhibiting factors and does not form a water-resistant crust that can inhibit plant growth. Provide a HECP Type 3 that completely photo-degrades or biodegrades. Do not use materials listed for use as HECP Type 1 or 2. Add seed, lime, and fertilizer to the HECP Type 3 mixture as outlined in the Seeding Specifications.

Furnish HECP Type 3 where all components are pre-packaged by the manufacturer to assure material performance and compliance with the minimum requirements of Table 1. Under no circumstances will field mixing of HECP Type 3 additives or HECP Type 3 components be accepted.

Provide HECP Type 3 listed on the most recent edition of the *SCDOT Qualified Product List 79*.

1.2.4 HECP Type 4

Provide a HECP Type 4 composed of a hydraulically applied matrix composed of non-toxic defibrated organic fibers, cross-linked insoluble hydro-colloidal tackifiers, and reinforcing natural and / or synthetic fibers. Do not use materials composed of paper, cellulose fiber, or any mixture containing paper or cellulose. Provide an HECP Type 4 composed of:

- A minimum of 70% non-toxic, long strand organic fibers.
- Non-toxic thermally processed or refined long strand organic fibers heated to a minimum temperature of 212 degrees Fahrenheit for sterilization purposes.
- Non-toxic interlocking natural or synthetic fibers.
- Non-toxic water insoluble cross-linked hydro-colloidal tackifiers.

Provide a HECP Type 4 that has no germination or growth inhibiting factors and does not form a water-resistant crust that can inhibit plant growth. Do not use materials listed for use as HECP Type 1, 2 or 3 applications. Add seed, lime, and fertilizer to the HECP Type 4 mixture as outlined in the Seeding Specifications.

Furnish HECP Type 4 where all components are pre-packaged by the manufacturer to assure material performance and compliance with the minimum requirements of Table 1. Under no circumstances will field mixing of HECP Type 4 additives or HECP Type 4 components be accepted.

Provide HECP Type 4 listed on the most recent edition of *SCDOT Qualified Products List 79.*

Table 1: Minimum HECP Performance and Physical Requirements

HECP Property	Test Method[1]	HECP Type 1	HECP Type 2	HECP Type 3	HECP Type 4
Physical					
Color	Observed	Colored to contrast application area, shall not stain concrete or painted surfaces.			
Organic Matter	ASTM D2974	90% minimum			
Water Holding Capacity	ASTM D7367	400% minimum	500% minimum	600% minimum	700% minimum
Acute Toxicity	ASTM 7101 EPA Method 2021 or EPA Method 2002	Non Toxic			
Endurance					
Functional Longevity	SCDOT Approved Testing Methods[4]	Up To 60 days	Up To 90 days	Up To 180 days	Up To 365 days
Performance					
Maximum Slope Application	Observed	4.0H:1V	3.0H:1V	2.0H:1V	1.0H:1V
Rainfall Event (R-factor)	ASTM D6459[2,3]	NA	75 < R	140 < R	175 < R
Cover Factor	ASTM D6459[2,3]	≤ 0.50	C ≤ 0.10	C ≤ 0.05	C ≤ 0.01
Vegetation Establishment	ASTM D7322[2]	200% minimum	300% minimum	400% minimum	500% minimum

[2] ASTM test methods developed for Rolled Erosion Control Products (RECPs) that have been modified to accommodate Hydraulic Erosion Control Products (HECPs).

[3] Utah State Protocol of 2.5:1 slope with rainfall simulated at 5 inches per hour for 60 minute duration, or TTI Protocol of 2:1 slope with rainfall simulated at 3.5 inches per hour with 3 successive test durations of 30 minutes each test in 24 hour intervals may be substituted for ASTM D6459.

[4] Functional longevity tests performed at a testing facility approved by the ENGINEER.

1.2.5 Quality Assurance

Provide HECP listed on the most recent edition of *SCDOT Qualified Product List 79* in the appropriate category.

At the time of delivery, provide the Engineer with the specific HECP packing list containing complete identification, including but not limited to the following:

- Manufacturer name and location,
- Manufacturer telephone number and fax number,
- Manufacturer's e-mail address and web address, and
- HECP name, model and/or serial number.
- Certification that the specific HECP meets the physical and performance criteria of this specification.

1.3 Construction Requirements

1.3.1 Installation

Use HECP where all components are pre-packaged by the manufacturer to assure material performance. Under no circumstances will field mixing of HECP additives or HECP components be accepted.

Examine substrates and conditions before applying materials. Do not proceed with installation until unsatisfactory conditions are corrected. Apply HECP to stable slopes that are constructed to divert runoff water away from the face of the slope, eliminating damage to the slope face caused by the surface flow from above the slope.

Use personnel or subcontractors experienced in the proper procedures for mixing and application of HECP. Use personnel or subcontractors certified and trained by the manufacturer in the proper procedures for mixing and application of HECP Type 3 and 4. Strictly comply with the manufacturer's mixing instructions. Use approved hydraulic seeding/mulching machines with appropriate nozzles for HECP applications. Apply HECP from opposing directions to the soil surface in successive layers, reducing the "shadow effect" to achieve maximum coverage of all exposed soil.

Allow HECP Type 1 and 2 a minimum of 48 hours to dry after installation. Allow HECP Type 3 a minimum of 24 hours to dry after installation. HECP Type 4 does not require a cure time and is effective immediately; therefore, HECP Type 4 may be applied immediately before, during, or after up to a 2-year storm event based on the inches of rain received for a given duration for the particular location as determined from the current NOAA precipitation tables. Avoid installing HECP Type 4 during high intensity rainfall events. Use HECP Type 4 when there is an immediate need for erosion prevention and rainfall is immanent.

The maximum allowable continuous slope length for HECP applications is 50 feet. Provide slope interruption devices for continuous slope length longer than 50 feet. Refer to Slope Interruption Devices Specification for slope interruption device description, materials, and construction requirements.

Install HECP materials at the application rates of Tables 4, 5, 6, 7, and 8.

Table 4: HECP Type 1 Installation Requirements

Slope Condition[1]	Minimum Application Rate (lbs/acre -dry) [2]
Slope ≤ 4:1	2,000
Slope > 4:1	Not Applicable

Table 5: HECP Type 2 Installation Requirements

Slope Condition[1]	Minimum Application Rate (lbs/acre -dry) [2]
Slope ≤ 4:1	Follow Table 4 Application Rates
4:1 < Slope ≤ 3:1	2,500
Slope > 3:1	Not Applicable

Table 6: HECP Type 3 Installation Requirements

Slope Condition[1]	Minimum Application Rate (lbs/acre -dry) [2]
Slope ≤ 3:1	Follow Table 4 and Table 5 Application Rates
3:1 < Slope ≤ 2:1	3,000
Slope > 2:1	Not Applicable

Table 7: HECP Type 4 Installation Requirements

Slope Condition[1]	Minimum Application Rate (lbs/acre -dry) [2]
Slope ≤ 2:1	Follow Table 4, Table 5, and Table 6 Application Rates
2:1 < Slope ≤ 1:1	3,500
Slope >1:1	4,000 (temporary cover)[3]

Table 8: Combined Mulch Table

Mulch[1]	Applicable Slopes	Minimum Application Rate (lbs/acre -dry) [2]
HECP Type 1 - Tracer under RECP	Per RECP	1,000
HECP Type 1	≤ 4:1	2,000
HECP Type 2	4:1 < S ≤ 3:1	2,500
HECP Type 3	3:1 < S ≤ 2:1	3,000
HECP Type 4	2:1 < S ≤ 1:1	3,500
	> 1:1	4,000 (temp cover only) [3]
When site constraints exceed the acceptable application for mulch, use Rolled Erosion Control Products (RECPs); Erosion Control Blankets (ECB) or Turf Reinforcement Matting (TRM)		

[1] The maximum allowable continuous slope length for mulch applications is 50 feet. Slope interruption devices or ECBs and TRMS are required for continuous slope length longer than 50 feet.

[2] A higher level of mulch may be applied than that specified on the Plans, Specifications, and other terms of the Contract. In this situation, the higher level mulch is applied at the rate for the actual slope condition of the site in accordance with the mulch tables, and payment is for the actual mulch specified, not the higher level mulch.

[3] HECP Type 4 may be used for permanent cover applications on slopes 1:1 or greater at a minimum rate of 4,500 pounds per acre as directed by the Engineer only when the proper TRM installation is not practicable due to site constraints.

1.3.2 Delivery Storage and Handling

Use HECP where all components are pre-packaged by the manufacturer to assure material performance. Have materials and products delivered in UV and weather resistant factory labeled packages. Store and handle HECP in strict compliance with the manufacturer's instructions and recommendations. Protect HECP from damage from weather, excessive temperatures, and construction operations. Clean all spills promptly.

1.3.3 Inspection and Maintenance

Prepare a HECP maintenance plan that includes the following:

- Reapply HECP as directed by Engineer to disturbed areas that require continued erosion control.
- Maintenance of equipment to provide uniform application rates.
- Rinsing all HECP mixing and application equipment thoroughly with water to avoid formation of residues and appropriate discharge of rinse water.

Degradation of HECP can be expected to occur as a result of mechanical degradation, chemical degradation, biological hydrolysis, sunlight, salt, and temperature. Where necessary, reapply HECP in accordance with the manufacturer's instructions. Reapplication is not required unless HECP treated soils are disturbed or turbidity or water quality shows the need for an additional application. If HECP treated soils are left undisturbed, the necessity of reapplication will be determined by the Engineer.

1.3.4 Acceptance

Obtain Engineer acceptance and approval of HECP installations. When requested by the Engineer, ensure that a manufacturer's representative is on-site to oversee and approve the initial HECP installation. Obtain a letter from the manufacturer approving the installation when requested by the Engineer.